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MEMORANDUM

TO: Chairman, Research, Development & Production Review Board

FROM: Chief, Engineering Division, OC

SUBJECT: Feasibility Study - Modification of [] Adaptor for A-3
(Telephony) Emission

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1. PROBLEM

(a) To study and report on the feasibility of modifying the

[] Transmitter Adaptor to permit voice modulation.

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(b) To report on the feasibility of using such a device

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2. ASSUMPTIONS

(a) It is assumed that the frequency of operation may be
selected anywhere within the frequency range of []

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(b) It is assumed that the base station will be equipped with
a receiver such as a []

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with a receiving antenna []

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[]

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(c) It is further assumed that the base transmitter will be
capable of transmitting a signal strong enough to provide
adequate communication from base to field.

(d) It is assumed that the size and weight of the present
adaptor may be increased by 50% and still be small
enough to be operationally acceptable.

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3. DISCUSSION

- (a) The present adaptor relies upon deriving plate and filament power from the receiver to which it is attached. Therefore, the power output developed by the unit when operated as a transmitter is dependent upon the power capabilities of the audio output stage in this receiver. A typical receiver might be expected to produce approximately 2-3 watts of audio power. This same receiver would probably produce about 2 watts of RF power output when used as a transmitter. The plate power input would be approximately 6 watts in this case. For 100% plate modulation, the modulator power required would be approximately 3 watts. Assuming the use of a vacuum tube as a modulator, with an efficiency of approximately 50% the total modulator plate power required would be approximately 6 watts. If this power were to be derived from the parent receiver, a condition of 100% overload would exist in the receiver plate power for audio purposes. This is not considered feasible.
- (b) Methods of modulation other than plate modulation will not be considered due to the relative inefficiency of other known methods.
- (c) If push-pull transistors operated in Class B were utilized for modulators, the power requirements would be reduced. ^{Since} ~~In~~ addition, filament power would not be required. Also, power drain in the no-signal condition could be made very small.

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- (d) A pair of 2N57 transistors operated in Class B with a collector supply voltage of 12 volts appears promising for this application. Since it does not appear feasible to use battery power for the modulator, some other source of 12 volts DC must be developed. It appears possible to derive this power from a voltage doubler type of rectifier using the 6.3 VAC filament supply as an input voltage. Approximately 4 watts would be drawn from the filament supply. In a typical home receiver employing a tube similar to a 6V6 in the audio output, the total filament power drain would be in the vicinity of 8-9 watts. An additional drain of 4 watts would represent a 40-50% overload and is considered feasible for short periods of time.

- (e) The signal would be propagated via the ground wave for the short ranges involved and the optimum frequency of

Bearing in mind the assumptions made in (2) above, and assuming an indoor antenna for the field transmitter, the maximum reliable range of such a system with approximately 2 watts of transmitting power should be close to that required in the statement of the problem. ^{the range} ~~the~~ of course would vary considerably with variations in types of receivers employed, types of transmitting antennas,

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terrain and obstructions, base station noise level, interfering signal levels, etc.

- (f) Such a modification of the adaptor for use as proposed would involve an increase in size and weight of at least 50%. The complexity of operation would probably be increased also since a modulation level control would no doubt be a necessity.
- (g) The circuit modifications discussed in paragraphs (c) and (d) above may or may not be feasible but appear promising enough to justify an experimental investigation.

4. CONCLUSIONS

- (a) There is a good possibility that the Transmitter Adaptor may be modified to produce a reasonable power output for voice communication. However, certain experimental investigations would be necessary before final conclusions may be drawn.
- (b) Assuming that approximately 2 watts of RF power could be generated by this unit, it is believed that useful communications could be conducted within the description of the stated operational application.

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5. RECOMMENDED ACTION

- (a) It is recommended that the necessary experimental work be authorized to determine the feasibility of modifying the subject adaptor for A-3 emission. If the results of

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this work indicate a positive answer, it is further recommended that a project be undertaken to produce a production prototype of the unit. If the work indicates a negative answer, it is recommended that the Board be so informed and the project cancelled.

- (b) It is recommended that the above work be performed at the R&D Laboratory, OC-E.



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